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Employment and Income Forecasts

MetroPlan 2000
A REGIONAL PLAN FOR THE BOSTON METROPOLITAN AREA

MAPC
Metropolitan Area
Planning Council
60 Temple Place
Boston , MA 02111

893/401

ABOUT THIS REPORT

The Metropolitan Area Planning Council is the designated regional planning agency for 101 cities and towns in metropolitan Boston. The Council helps its member communities plan in the areas of economic development, housing, demographics, transportation, water, solid waste and open space.

This report was funded by assessments from the member cities and towns of the MAPC region. The responsibility for the information and opinions contained in this report rests solely with the Metropolitan Area Planning Council.

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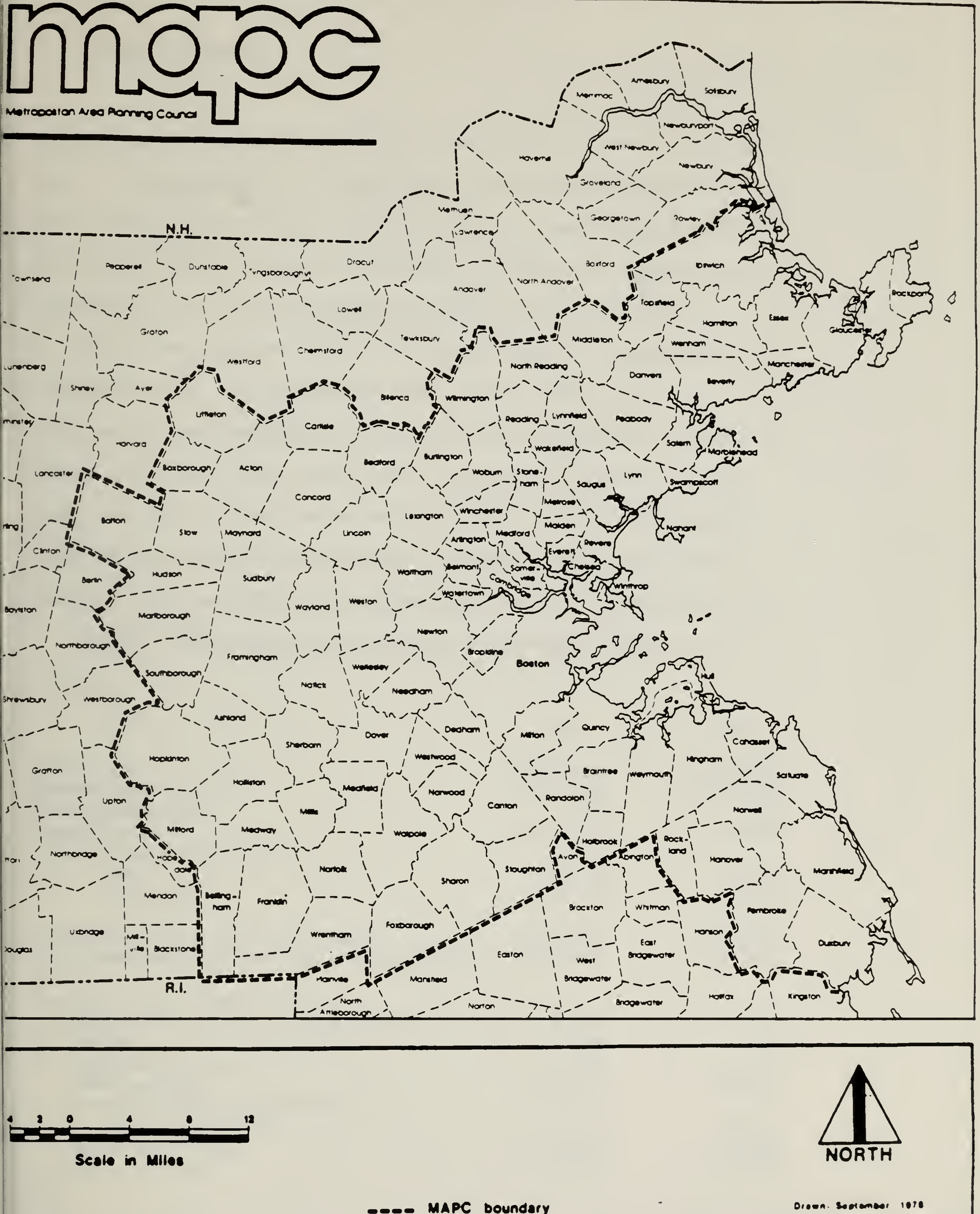
Metropolitan Area Planning Council



I. EXECUTIVE SUMMARY

The Boston metropolitan region is the social, economic and cultural heart of Massachusetts. In recent years, the region has been the scene of a remarkable renaissance which has seen its transformation from a relatively stagnant economy to one which has nearly the lowest rate of unemployment and one of the highest income levels in the nation.

This report provides recent trends and forecasts in employment and income from 1972 through the year 2010 for the MAPC region. Econometrics and demography are used to analyze and forecast trends in the region's labor force, employment, employment by sectors, annual wage, per capita income and household income. Comparisons are made with the Boston-Lawrence-Salem-Lowell-Brockton New England County Metropolitan Area (NEMA), Massachusetts and the U.S. where appropriate.

Various MAPC estimates and forecasts for the MAPC region are as follows.

	1986	2000
Population	2,882,990	2,937,880
Number of Households	1,117,438	1,239,612
Unemployment Rate	3.4%	2.7%
Labor Force	1,577,014	1,727,095
Labor Force Participation		
Male	76.4%	76.2%
Female	60.1%	67.5%
Employment (By Place of Residence)	1,523,580	1,680,463
Net Commuting (In-Commuting - Out-Commuting)	203,861	333,855
Employment (By Place of Work)		
Agriculture, Forestry & Fisheries	8,276	9,470
Mining	770	970
Contract Construction	63,808	73,120
Manufacturing	303,124	309,600
Transportation, Communication & Public Utilities	73,524	86,010
Wholesale Trade	99,908	116,430
Retail Trade	290,300	334,980

	1986	2000
Employment (By Place of Work - Continued)		
Finance, Insurance & Real Estate	142,775	174,240
Services	546,187	696,950
Government	197,535	213,120
Total	1,727,441	2,014,318
Average Annual Wage (Current $)	22,808	50,308
Per Capita Income (Constant 1986 $)	15,152	22,094
Mean Household Income (Constant 1986 $)	39,137	52,364
Median Household Income (Constant 1986 $)	32,614	42,572

Some of the implications of the MAPC forecasts are:

- A tight labor supply will constrain the size and rate of future employment growth.
- The high rate of future income growth is expected to exceed the national rate.
- The high level and growth rate of wages will reduce the rate of future job growth especially in some service sectors.
- The manufacturing sector's share of overall employment will continued to decline. The region's high export dependence, especially in high technology, could produce wide business cycle variations.

II. DATA

This report uses data published by the Bureau of Labor Statistics, U.S. Department of Labor in the BLS-790 Series, known as the Current Employment Statistics (CES) Program, by the Massachusetts Division of Employment Security (DES) in the ES-202 Series, known as the Employment & Wage Program and by the Bureau of Economic Analysis (BEA) and Bureau of the Census, U.S. Department of Commerce.

Data on employment and earnings for the Boston Standard Metropolitan Statistical Area (SMSA) up to 1983 and on the Boston Primary Metropolitan Statistical Area (PMSA) after 1983 were taken from the ES-202 and BLS-790 series collected by DES. Since the SMSA, PMSA and MAPC region are not comparable because of differences in geographical coverage, the available data were modified to construct comparable time series for the region.

The present Standard Industrial Classifications date back only to 1972, with substantial SIC code changes before that year. Therefore, it was decided not to use pre-1972 data.* Most statistics in this report will use the years 1973, 1978 and 1983 to facilitate comparison with the BEA data and forecasts available for the Boston-Lawrence-Salem-Lowell-Brockton NECMA.

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* For details on the data see Appendix A.

III. EMPLOYMENT AND INCOME TRENDS

A. TOTAL EMPLOYMENT GROWTH

In recent years the rate of growth of employment has been remarkably high in the MAPC region compared to the past. For the years between 1973 and 1986 it was 2.1% as against 2.2% for the nation. Comparative growth rates in employment for the MAPC region and United States are presented below.

	AVERAGE ANNUAL RATE OF GROWTH (PERCENT)			
	1973-1978	1978-1983	1983-1986	1973-1986
MAPC region	1.5	1.8	2.8	2.1
United States	2.6	1.0	2.9	2.2

B. UNEMPLOYMENT

The rate of unemployment in the MAPC region has fallen from a high of 10.5% in 1975 to just 3.4% in 1986, a record low. Since 1978, the region's unemployment rate has remained much below the rate for the nation (refer to Appendix 1).

C. CYCLICAL PATTERNS

The region has had three national recessions between 1972 and 1986 of varying degrees of impact on the area's economy. During the first recession in 1974-75, employment in the region dropped by 3.1% or 41,470 jobs. During the subsequent recovery period between 1975 and 1979, employment rose by 14.5% or 192,000 jobs. The second economic downturn passed almost unnoticed in the MAPC region. A third recession between 1981 and 1982, which had devastating national effects, made employment in the region fall by less than 0.5%.

D. LABOR FORCE AND EMPLOYMENT BY RESIDENCE AND PLACE OF WORK*

The labor force grew at a relatively low rate as compared to employment by place of residence* between 1973 and 1986. The major part of this difference is explained by a large increase in female labor force participation. Additionally, the region has a long-established pattern of net out-migration of workers. Even during the recent economic boom this trend has not reversed. The growth rate of employment by place of work is much higher than that of employment by place of residence. This reflects the fact that employers in the MAPC region have been drawing considerable labor from those living outside of the region.

Patterns of growth in labor force, employment by place of residence and employment by place of work in the MAPC region between 1973 and 1986 are shown below.

---

* Labor force refers to the population 16 years and over who are working (employed) or who are looking for work (the unemployed), i.e. labor force = population 16 and over * labor force participation rate. Employment (by place of residence) is the labor force that is employed within the region where they live. Employment (by place of work) consists of residents who work within the region and nonresidents who commute from outside, i.e. employment (by work) in a region = employment (by residence) - residents working outside the region + nonresidents working within the region. References to "employment" in this report refer to place of work employment unless specifically stated otherwise.

	AVERAGE ANNUAL RATE OF GROWTH (PERCENT) 1973-83	1973-78	1978-83	1983-86
Labor Force	1.4	1.4	1.2	1.4
Employment by Place of Residence	1.7	1.6	1.2	2.3
Employment by Place of Work	2.1	1.5	1.8	2.8

(Refer to Figure 1 and Appendix 2 & 4).

E. LABOR FORCE PARTICIPATION

Growing female labor force participation is a major factor in the region's high rate of employment growth, while male labor force participation has declined gradually over time. The labor force participation for women is significantly higher for the region than nationally, yet has been increasing at a rate comparable to that for the nation in recent years. It is estimated that about 79,500 additional women entered the MAPC region's labor force between 1980 and 1986, providing 43 per cent of the new labor supply. Married women, especially those with preschool children, have been the primary contributors to the increasing rate of participation.

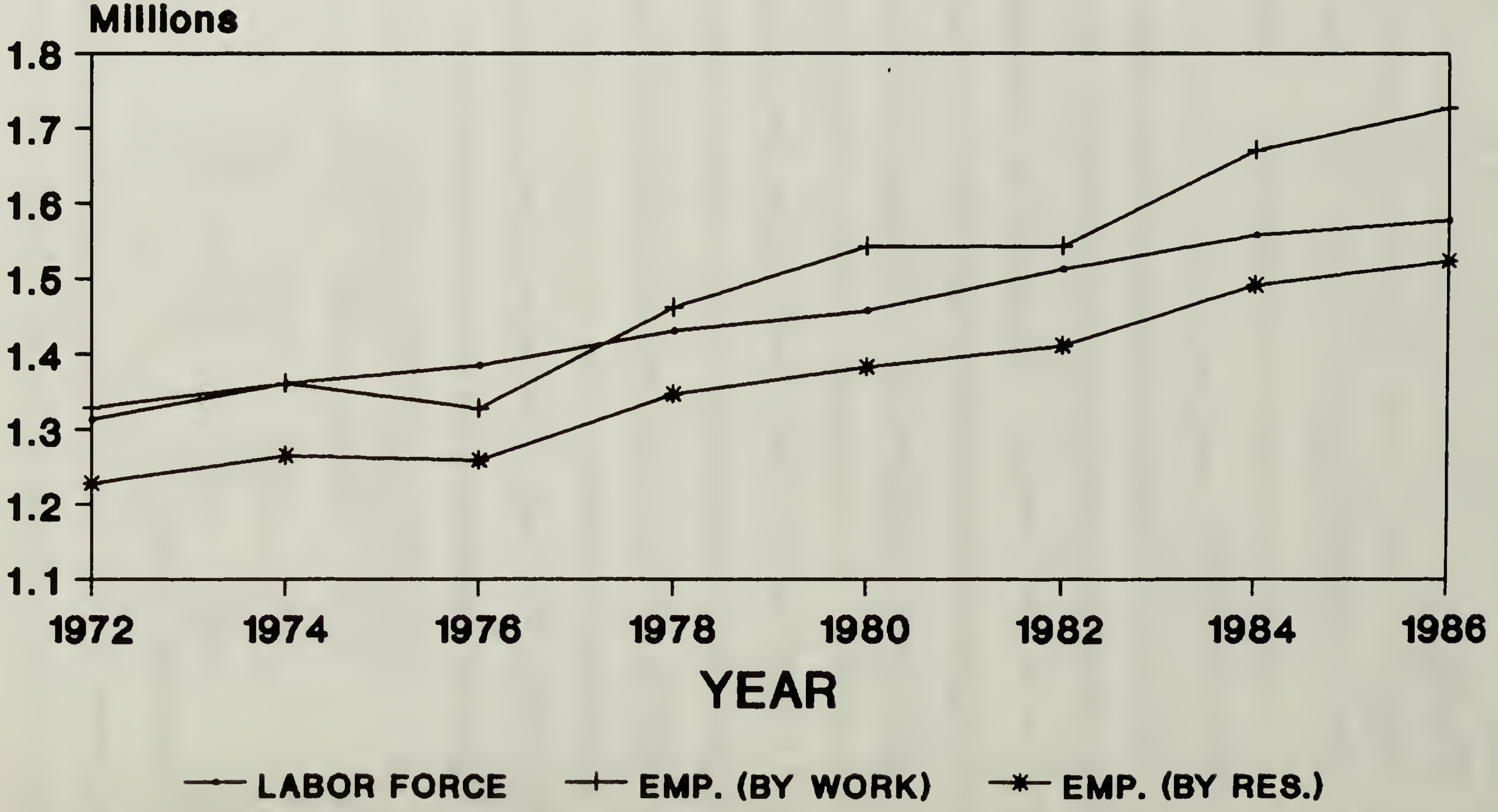
Comparative labor force participation rates for the Boston SMSA/PMSA and United States are presented below (refer to Appendix 3).

	LABOR FORCE PARTICIPATION (PERCENT)			
	BOSTON SMSA/PMSA		UNITED STATES	
YEAR	MALE	FEMALE	MALE	FEMALE
1974	80.4	47.5	78.7	45.8
1978	79.8	54.8	78.1	50.0
1983	78.2	56.7	76.4	52.9
1986	76.4	60.1	76.3	55.3

F. SECTORAL EMPLOYMENT GROWTH

Services showed the most rapid growth in employment among the major sectors during 1973-86, followed by finance, insurance and real estate.

FIGURE 1
MAPC REGION
LABOR FORCE & EMPLOYMENT



In the services sector, business services, especially computer and data processing have been the major contributors to job growth, followed by educational and health services. In recent years, finance, insurance and real estate and wholesale trade employment have grown remarkably. In the manufacturing sector, while nondurable goods steadily lost employment over time, durable goods grew rapidly up to 1979, moderately from 1979 to 1985 and declined after 1985. Contract construction employment has been subject to extreme fluctuations during economic expansions and recessions. Employment in the government sector has also been subject to wide fluctuations, but unrelated to economic cycles.

Fluctuation in the growth rates reflect the cyclical effects on sectoral employment. Growth rates in the major employment sectors between 1973 and 1986 were as follows.

	AVERAGE ANNUAL RATE OF GROWTH (PERCENT)		
SECTOR	1973-78	1978-83	1983-86
AGRICULTURE	0.9	1.1	3.7
MINING	1.3	8.8	22.5
CONSTRUCTION	-5.5	3.3	12.5
MANUFACTURING	0.4	1.3	-3.4
TRANSPORTATION	-2.3	0.2	0.7
WHOLESALE TRADE	0.1	1.8	5.6
RETAIL TRADE	0.1	2.6	3.3
FINANCE	1.2	3.4	6.6
SERVICES	4.8	4.8	5.5
GOVERNMENT	3.7	-3.3	1.0

(Refer to Figures 2 & 3 and Appendix 5 through 14)

G. SECTORAL SHARES OF TOTAL EMPLOYMENT

Another perspective considers the proportion of overall employment in each of the major sectors.

FIGURE 2
MAPC REGION
AVERAGE ANNUAL EMPLOYMENT

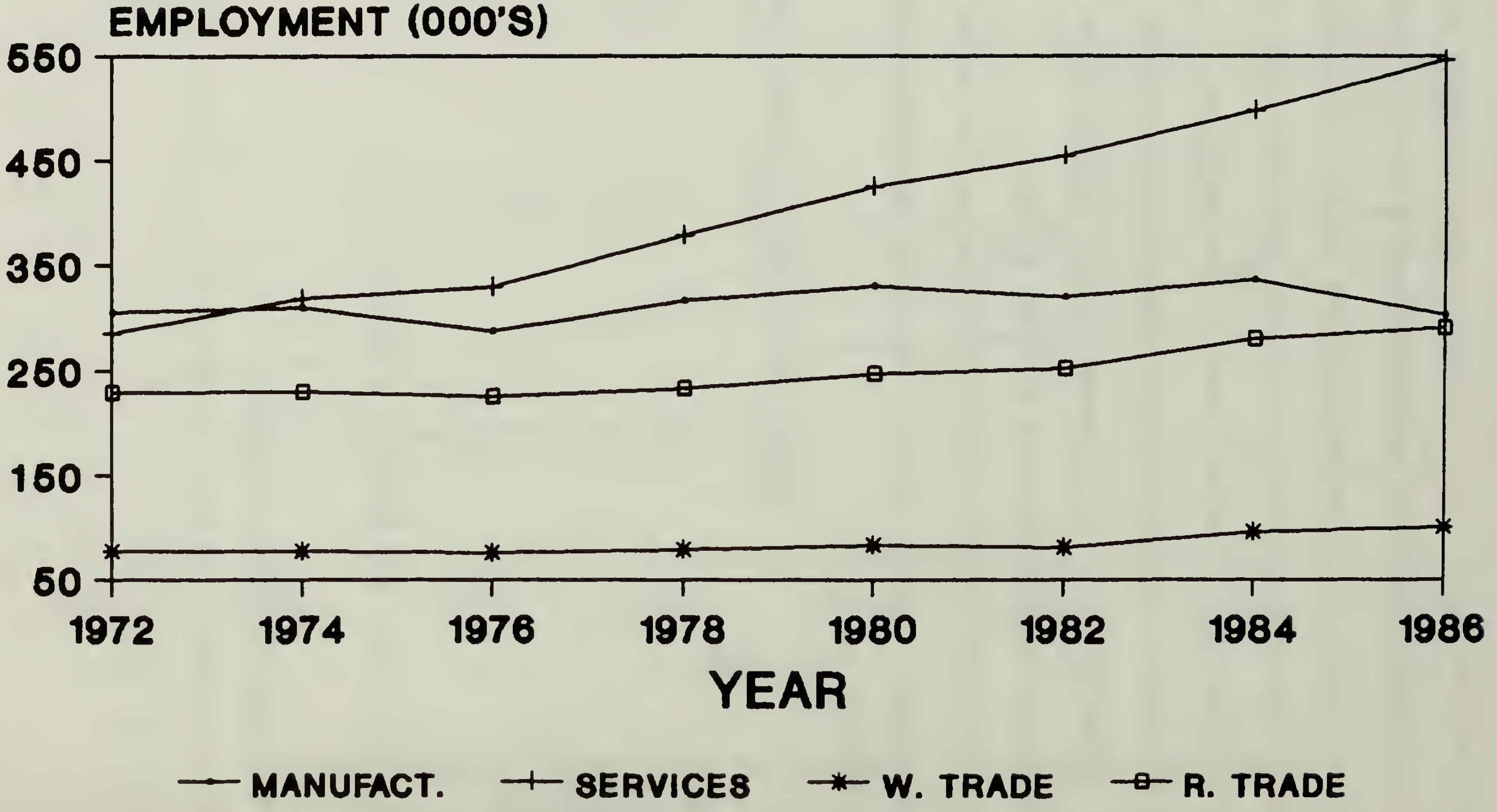
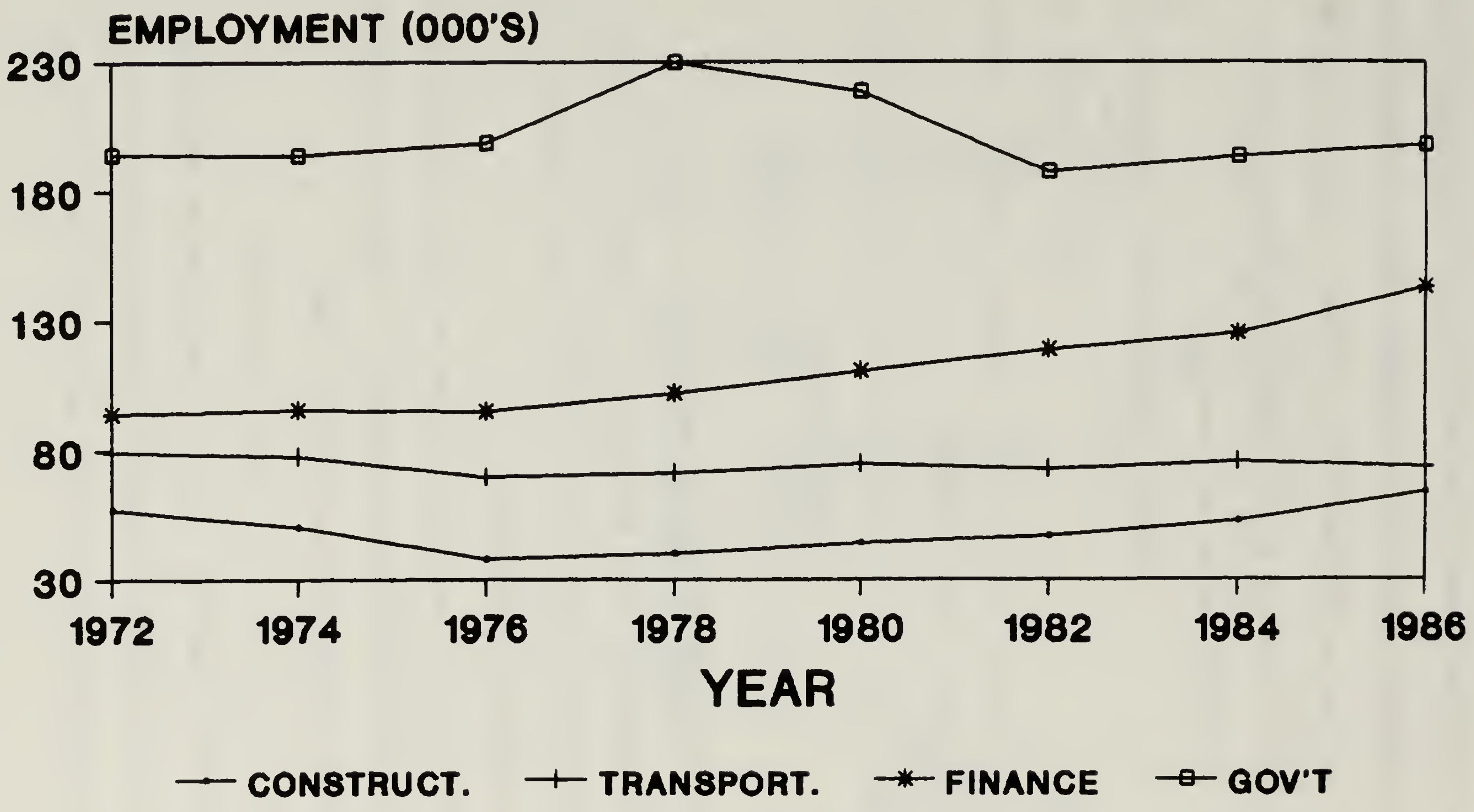


FIGURE 3
MAPC REGION
AVERAGE ANNUAL EMPLOYMENT



The goods-producing sectors have declined while the service-producing sectors have expanded tremendously over the years. Most of the sectors have moderately contracted in terms of regional employment share, while services increased from 24% to 31% between 1973 and 1986. Finance, insurance and real estate has also expanded -- by more than one percentage point in overall share to 8.3% in 1986. The largest losses in employment share were in manufacturing and government.

SECTOR	AVERAGE PERCENT OF TOTAL EMPLOYMENT 1973-76	1983-86
AGRICULTURE	0.4	0.5
MINING	0.0	0.0
CONSTRUCTION	3.4	3.3
MANUFACTURING	22.2	19.4
TRANSPORTATION	5.6	4.4
WHOLESALE TRADE	5.8	5.6
RETAIL TRADE	17.1	16.8
FINANCE	7.1	7.7
SERVICES	23.9	30.7
GOVERNMENT	14.6	11.7

H. AVERAGE WAGE AND PER CAPITA INCOME*

The average annual wage increased at a moderately high rate during 1973-86; the rate was higher for 1978-1983 (10.5%) than for either 1973-78 or 1983-86 (refer to Appendix 15).

Both the level of per capita income and its growth rate have been higher in the MAPC region than nationally. Regional per capita income was $15,152 versus $11,670 for the nation in 1986.

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* In this report we use the concept of money income defined by the Bureau of the Census and not the concept of personal income defined by the Bureau of Economic Analysis. For concepts and distinction see Appendix A.

Per capita income has gone up by 67% in the region while only 50% in the nation between 1980 and 1986. The primary reason for the region's higher per capita income growth relates both to its lower rate of population growth and higher rate of growth in total income. Growth rates in the region's per capita income are given below for selected years.

	PER CAPITA INCOME AVERAGE ANNUAL GROWTH RATE (PERCENT)
1980-1983	9.6
1983-1986	9.8
1980-1986	11.1

I. AVERAGE AND MEDIAN HOUSEHOLD INCOME

The region's median and average household income is about 30 percent higher than the nation as of 1986. Moreover, by either income measure the disparity between the region and the nation has widened since 1980.

HOUSEHOLD INCOME

	BOSTON SMSA/PMSA		UNITED STATES	
	1980	1986	1980	1986
Median*	$20,128	$32,614	$17,710	$24,897
Average	$24,200	$39,137	$21,063	$30,759

IV. MAPC FORECAST METHODS

An econometric method relying on analysis of time series data through a regression approach was used by MAPC for short-range forecasts. For development of long-range forecasts, a combination of econometric and demographic methods was considered appropriate with assumptions about the future course of the regional economy. Regional, state and national forecasts by the BLS and BEA were also taken into account where appropriate in developing our various regional forecasts.

A. EMPLOYMENT FORECAST METHOD

The method used to forecast employment for the region is a blend of "bottom-up" and "top-down" approaches*. Current employment was regressed on past employment levels in a time series model using data from 1972 through 1986. An econometric forecast of total employment for 1990 was derived taking into account both trend and cyclical factors.

Relying solely on an econometric method was considered inappropriate for long-range forecasts. Beyond 1990, projections of total employment were based on a mixture of econometric and demographic approaches with reasonable assumptions regarding unemployment, labor force, labor force participation and work-commuting in 2000. For all the forecasts beyond 1990, the year 2000 was taken as the reference point.

---

* For details of our methodology see Appendix B.

B. ASSUMPTIONS AND UNDERLYING FORECASTS

1. LABOR FORCE SIZE

Our estimate of the region's labor force size in 2000 is 1,727,095, an increase of 9.5% between 1986 and 2000. This is comparable to a BLS forecast of an 18% increase in labor force between 1986 and 2000 for the nation as against an increase of 35% between 1972 and 1986. During the period 1972-1986, labor force in the MAPC region grew by 20%. Given the MAPC forecast of population of 2,937,880 in 2000, the implied labor force/population ratio of 59% is reasonable*. The unemployment rate for the MAPC region in 2000 is estimated at 2.7% based on historical trends (see Appendix 1).

2. LABOR FORCE PARTICIPATION

MAPC forecasts that male labor force participation for the region will be 2 percentage points higher and female labor force participation 6 percentage points higher than the nation in 2000 (76.2% and 67.5% respectively). The forecasts are based on extrapolations of past trends, assumptions regarding future attachment to the labor force and national labor force participation forecasts by BLS.

3. EMPLOYMENT BY PLACE OF RESIDENCE

Employment by place of residence in 2000 is estimated at 1,680,463 for the MAPC region by using the forecasts for labor force and unemployment rate discussed above.

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* For comparison with figures for 1980-86 see Appendix 18.

4. NET COMMUTING

Net commuting for the region (in-commuting - out-commuting) is equal to the difference between employment by place of work and employment by place of residence. Net commuting was modeled as a function of the differential between the MAPC region and Massachusetts average annual wage. The relationship was studied by time series regression using 1972-1986 data. The wage differential in 2000 was forecast at $3,050 which implied a net commuting of 333,855 in 2000. For 1986, the figure was 203,861.

5. EMPLOYMENT BY PLACE OF WORK

Adding net-commuting to the forecast for employment by place of residence gives a forecast of employment by place of work of 2,014,318 in 2000. The implied employment by place of work/population ratio in 2000 is 68.6% -- a reasonable figure, given historical trends and the fact that employers within the MAPC region have been drawing considerable labor from outside the region.

C. MAPC SECTORAL EMPLOYMENT FORECAST METHOD

Sectoral employment forecasts were developed as follows*.

1. 1990 employment shares for the major sectors were based on extrapolation of current trends with adjustments for cyclical factors.

2. Beyond 1990, forecasts were made using historical trends in the time series for 1972-86 and judgement.

D. MAPC EARNINGS AND INCOME FORECAST METHOD

Forecasts of annual wage were developed from a time series regression on the wage series for 1972-1986. Annual payroll was forecast, multiplying projected wage with projected employment.

Total income projections were based on extrapolations of historical total income/annual payroll ratios and forecasts of annual payroll. Per capita income and average (mean) household income were projected dividing the total income forecasts by the forecasts of population and number of households developed by MAPC. Median household income was projected using forecasts of average household income and extrapolations of historical median/average household income ratios.

The above forecasts of per capita income, mean and median household income were made in current dollars (unadjusted for inflation). For meaningful comparison with 1986, the current dollars estimates were converted to constant 1986 dollars using a projection of purchasing power measured in consumer prices. The purchasing power projections were based on time series regression with Bureau of Labor Statistics data on consumer price indices for 1967-86.

The MAPC region population forecasts are based on analysis of community trends and patterns in natural increase (births - deaths) and net migration, availability of undeveloped land and recent developer interest. The household forecasts are based on extrapolation of average household size using data from the last federal three censuses.

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* See Appendix B for details.

V. MAPC EMPLOYMENT, EARNINGS AND INCOME FORECASTS

A. TOTAL EMPLOYMENT

	TOTAL EMPLOYMENT (BY PLACE OF WORK)	MAPC REGION CUMULATIVE NO. OF NEW JOBS	PERCENTAGE INCREASE FROM 1986*
1986	1,727,441		
1990	1,862,770	135,329	10.1
1995	1,939,321	211,880	14.1
2000	2,014,318	286,877	16.6
2005	2,045,846	318,405	18.4
2010	2,062,213	334,772	19.9

(See Figure 4)

B. SECTORAL EMPLOYMENT

MAPC REGION SECTORAL EMPLOYMENT (IN THOUSANDS)

SECTOR	1986	1990	1995	2000	2005	2010
AGRICULTURE	8.3	9.1	9.3	9.5	9.6	9.7
MINING	0.8	0.9	0.9	1.0	1.0	1.0
CONSTRUCTION	63.8	72.1	73.7	73.1	73.6	72.2
MANUFACTURING	303.1	298.6	305.1	309.6	313.8	315.5
TRANSPORTATION	73.5	85.6	87.7	86.0	87.1	87.8
WHOLESALE TRADE	99.9	110.3	113.9	116.4	117.6	118.2
RETAIL TRADE	290.3	315.7	327.6	335.0	341.0	344.4
FINANCE	142.8	164.3	170.5	174.2	176.6	178.0
SERVICES	546.2	627.5	666.3	697.0	709.9	717.4
GOVERNMENT	197.5	217.5	216.6	213.1	215.6	217.1
TOTAL	1727.4	1901.6	1971.2	2014.3	2045.8	2062.2

(See Figure 5)

FIGURE 4

MAPC REGION
CUMULATIVE NO. OF NEW JOBS

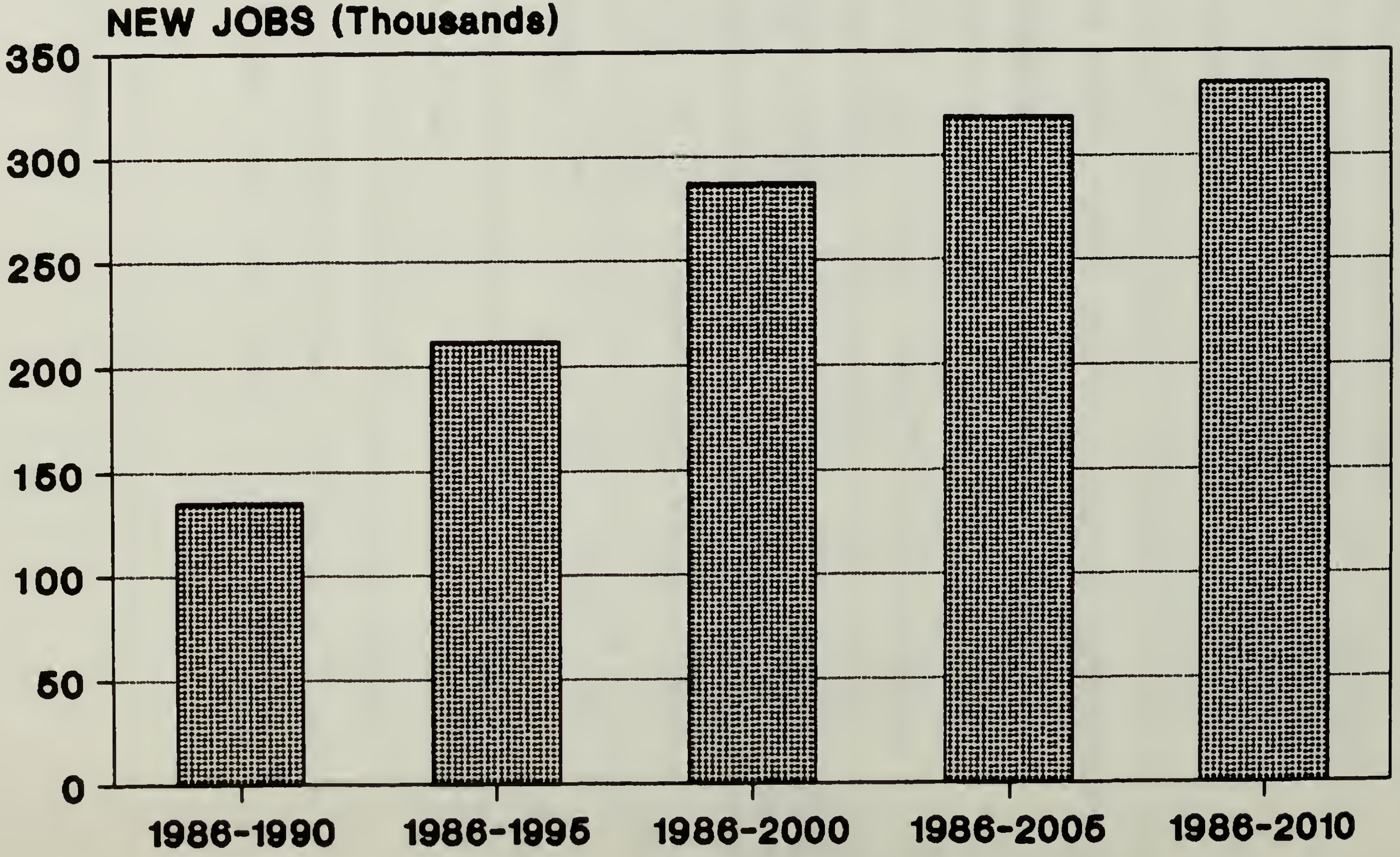
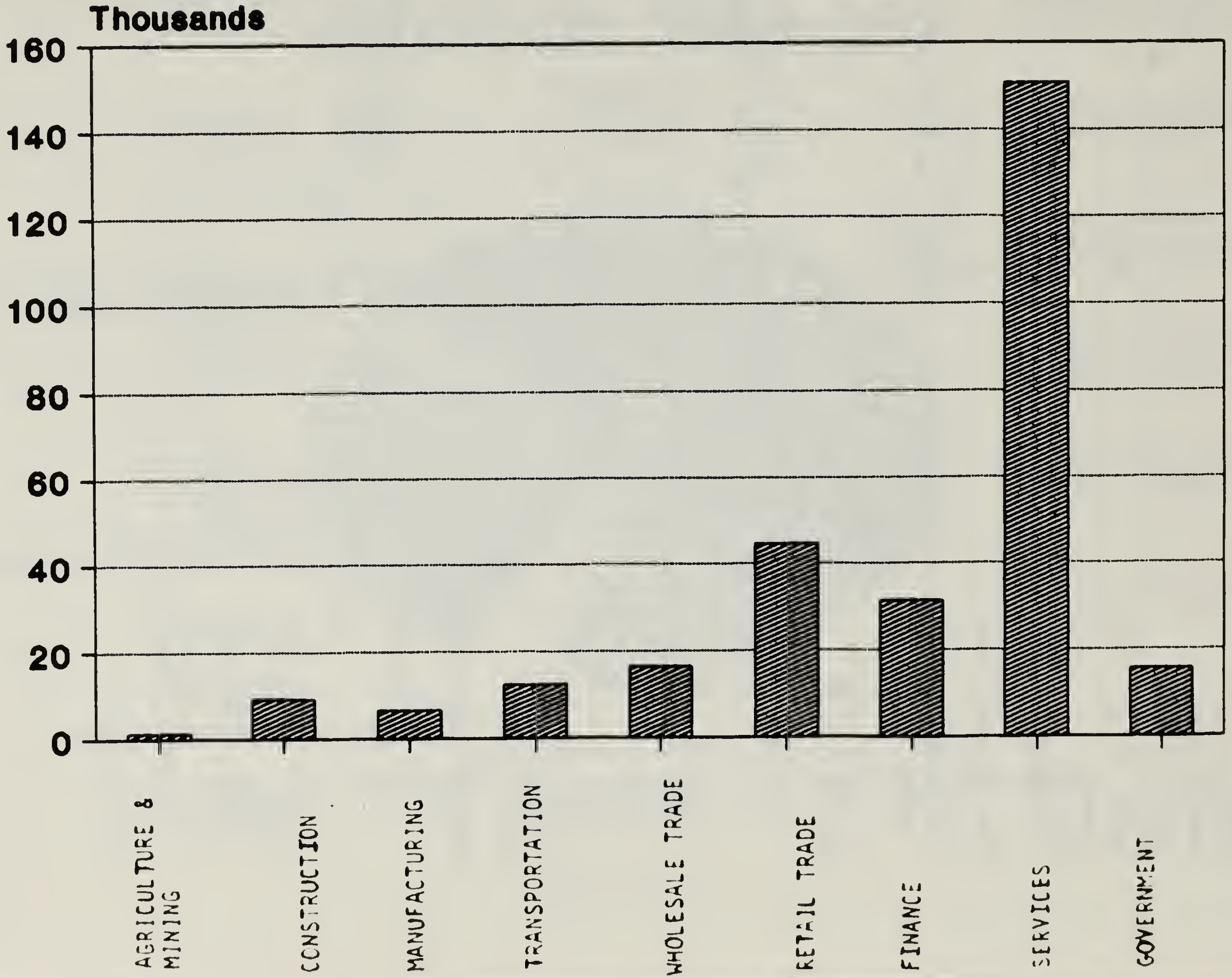


FIGURE 5

MAPC REGION
INCREASE IN NO. OF JOBS (1986-2000)



PERCENT OF THE MAPC REGION'S TOTAL EMPLOYMENT*

SECTOR+	Average 1983-86	1990	1995	2000	2005	2010
AGRICULTURE	0.5	0.5	0.5	0.5	0.5	0.5
MINING	0.1	0.1	0.1	0.1	0.1	0.1
CONSTRUCTION	3.3	3.8	3.7	3.6	3.6	3.5
MANUFACTURING	19.4	15.7	15.5	15.4	15.3	15.3
TRANSPORTATION	4.4	4.5	4.4	4.3	4.3	4.3
WHOLESALE TRADE	5.6	5.8	5.8	5.8	5.7	5.7
RETAIL TRADE	16.8	16.6	16.6	16.6	16.7	16.7
FINANCE	7.7	8.6	8.6	8.6	8.6	8.6
SERVICES	30.7	33.0	33.8	34.6	34.7	34.8
GOVERNMENT	11.6	11.4	11.0	10.6	10.5	10.5

(See Figures 6 and 7)

---

* For comparison with national and state forecasts see Appendix 9.

+ Totals may not add up to 100% because of rounding.

C. MAPC EARNINGS AND INCOME FORECASTS

CURRENT DOLLAR

	AVERAGE ANNUAL WAGE (CURRENT $)	ANNUAL PAYROLL (CURRENT $ MILLION)	TOTAL INCOME (CURRENT $ MILLION)
1986	$ 22,808	$ 39,400	$ 43,684
1990	29,500	56,030	61,633
1995	39,100	77,136	84,849
2000	50,300	101,501	111,652
2005	63,000	128,886	141,130
2010	77,200	159,211	174,336
% INCREASE (1986-2000)	121	158	156

CONSTANT DOLLAR

	POPULATION	PER CAPITA INCOME (IN 1986 DOLLARS)	NO. OF HOUSEHOLDS	HOUSEHOLD INCOME AVERAGE (IN 1986 DOLLARS)	HOUSEHOLD INCOME MEDIAN (IN 1986 DOLLARS)
1986	2,882,990	$ 15,152	1,117,438	$39,137	$ 32,614
1990	2,928,970	18,020	1,171,600	45,050	37,230
1995	2,942,170	20,350	1,210,800	49,450	40,530
2000	2,937,880	22,090	1,239,600	52,360	42,570
2005	2,934,770	23,030	1,259,600	53,670	43,280
2010	2,932,300	23,460	1,280,500	53,730	43,300
% INCREASE (1986-2000)		46	15	34	31

(See Figure 8)

FIGURE 6

MAPC REGION
SECTORAL EMPLOYMENT SHARES
(AVERAGE 1983-86)

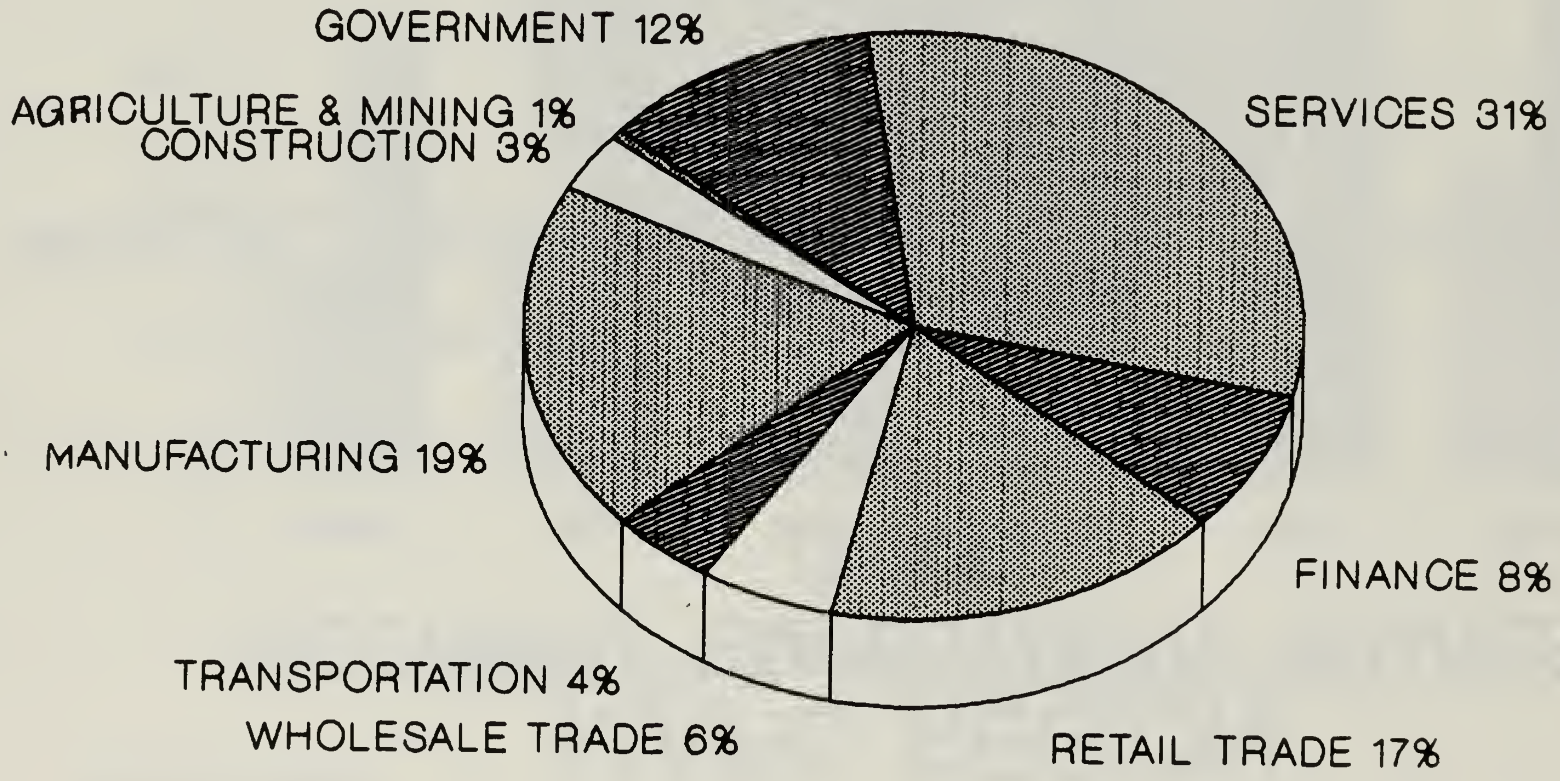


FIGURE 7

MAPC REGION
SECTORAL EMPLOYMENT SHARES
(2000)

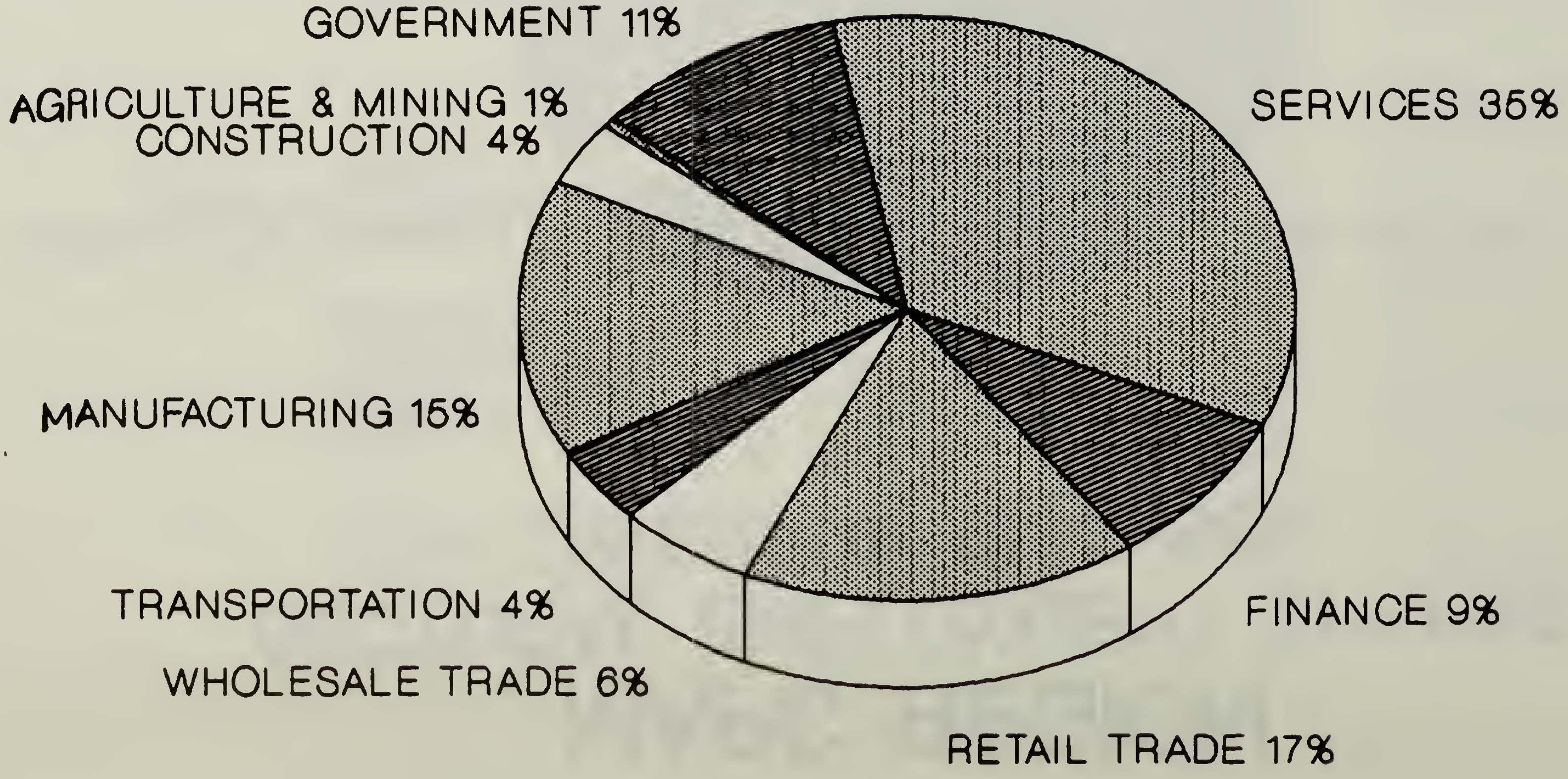
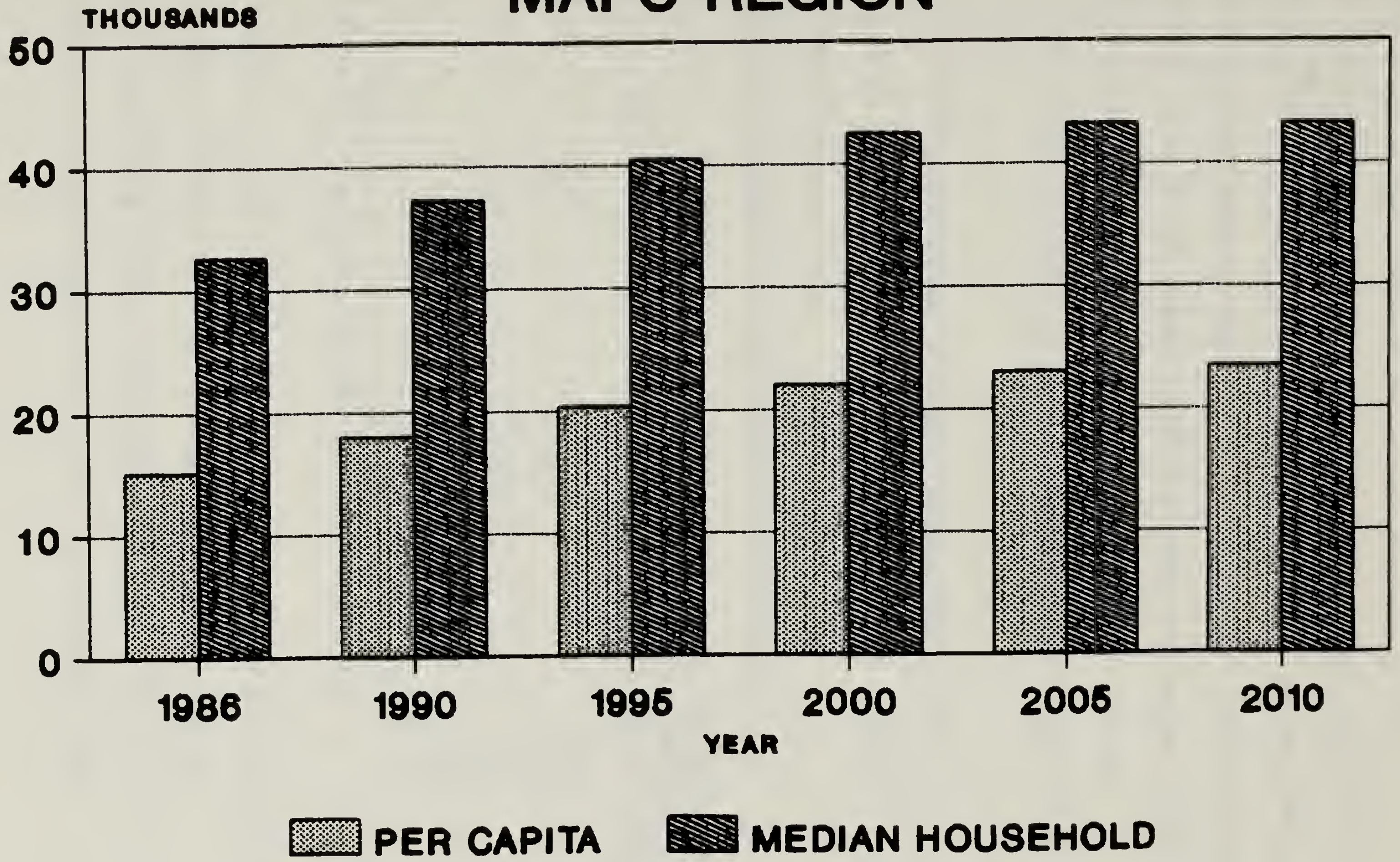


FIGURE 8

MEDIAN HOUSEHOLD AND PER CAPITA INCOME FORECASTS (1986 dollars) MAPC REGION



SOURCE: MAPC

VI. COMPARISON OF MAPC, BEA AND DES FORECASTS

A. TOTAL EMPLOYMENT COMPARISONS

BEA has projected an increase in employment by place of work of 31% between 1983 and 2000, 35% between 1983 and 2005 and 37% between 1983 and 2015 for the Boston-Lawrence-Salem-Lowell-Brockton NECMA*. MAPC projects an employment increase of 14% between 1986 and 1995, 17% between 1986 and 2000, and 19% between 1986 and 2000 for the MAPC region. DES has projected an employment increase of about 16% between 1984 and 1995 for Massachusetts**.

Thus, the overall employment forecasts up to 1995 by MAPC are similar to those by DES, while its longer-term employment forecasts are significantly below those of BEA.

PROJECTED PERCENTAGE GROWTH RATES IN TOTAL EMPLOYMENT

	BY MAPC	BY BEA MIDDLE-SERIES PROJECTIONS	
	MAPC REGION	MASSACHUSETTS	BOSTON-LAWRENCE-SALEM-LOWELL-BROCKTON(NECMA)
1983-1990	19.4	17.8	18.1
1990-1995	3.7	7.9	8.2
1995-2000	2.2	5.3	5.5
2000-2005	1.6	3.4	3.6
2005-2015	1.6***	2.1	2.3
1983-2015	-	36.7	37.8

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* See * and ** footnotes on the following page.
*** Prorated from 1st five years through the 2nd five years.

Other agencies in addition to MAPC have concluded that the supply of and not the demand for labor will be the determining factor in the region's future employment growth. We believe that our forecasts have a greater likelihood of realization than those of BEAs because they:

1) are based on 15 years of historical data through 1986; 2) take into account cyclical behavior in addition to movements in the trend; and 3) are region specific with respect to the potential for additional increases in labor force size and labor force participation.

BEAs forecasts for the Boston NECMA beyond 1990 seem optimistic and unrealistic in certain premises. There are four shortcomings to BEA's employment forecast method which is detailed in Appendix C of this report.

1. The period 1969-1973 was a period of unusually severe recession in Massachusetts. Therefore, BEA's employment forecast extrapolation using 1969-1973 as an initial base point is likely to over-forecast future growth.

2. The BEA forecasts use averages of only two periods to determine historical growth instead of a time series.

3. BEA's model does not consider critical supply side limitations such as availability of undeveloped land, energy supplies or labor supply. BEA's forecast of an increase of more than 17% in the population of Boston-Lawrence-Salem-Lowell-Brockton (NECMA) between 1983 and 2000 is inexplicably higher than population changes dating from several decades ago through the 1986 Census Bureau population estimates.

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* For comparative growth rates of Massachusetts & Boston-Lawrence -Salem-Lowell-Brockton based on BEA forecasts see Appendix 9.

** See "Massachusetts Employment: Projected changes 1980 to 1990"," Occupation/Industry Research Publication, Massachusetts Division of Employment Security.

The MAPC region also contains a relatively high density of development and a small quantity of vacant industrial and commercially zoned land.

4. BEA's methodology is determined by the national context and does not consider factors unique to the metropolitan Boston region such as a low rate of natural increase in population, an established pattern of net out-migration, high cost of living and strong local zoning and regulatory controls.

B. SECTORAL EMPLOYMENT COMPARISONS

COMPARATIVE EMPLOYMENT FORECASTS: 2000
PERCENTAGE OF TOTAL EMPLOYMENT

INDUSTRY	UNITED STATES BY BLS	UNITED STATES BY BEA	MASSACHUSETTS BY BEA	BOSTON NECMA BY BEA	MAPC REGION BY MAPC
AGRICULTURE	2.2	1.0	0.9	0.7	0.6
MINING	0.5	0.9	0.0	0.0	0.0
CONSTRUCTION	4.3	5.1	4.2	3.9	3.6
MANUFACTURING	13.7	16.9	21.2	20.8	15.6
TRANSPORTATION	4.3	5.0	4.3	4.5	4.3
WHOLESALE TRADE	5.5	5.2	5.2	5.3	5.5
RETAIL TRADE	17.1	16.8	17.0	15.6	16.7
FINANCE, INSURANCE & REAL ESTATE	6.0	6.4	7.1	7.3	8.9
SERVICES	24.5	25.7	29.6	31.4	32.8
GOVERNMENT	13.8	14.2	10.7	10.4	12.0

Percentages may not add up to 1 exactly because of rounding

The major differences between MAPC and BEA sectoral employment shares are in the following areas. First, BEA foresees an increase in manufacturing employment share from the 1983-1986 average of 19.4% to 20.8% by 2000 for the Boston NECMA. By contrast, MAPC forecasts a continuing decline in manufacturing employment share to 15.6% by 2000. Second, MAPC's sectoral share employment forecasts foresee a share increase in finance, insurance and real estate and relative share stability in government.

BEA forecasts a moderate employment share decline in both finance, insurance and real estate and government. The greater concentration of government and finance employment within the MAPC region compared to the larger area of NECMA may account for these forecast differences. Third, MAPC forecasts moderately higher employment shares for both the retail trade and services sector compared to those forecasts by BEA.

C. EARNINGS AND INCOME COMPARISONS

The earnings and income forecasts by BEA are not comparable to those by MAPC. While BEA uses the concept of personal income, MAPC uses the concept of money income as defined by the Bureau of the Census+. Moreover, BEA projections are in 1972 dollars while MAPC projections are in 1986 dollars. BEA projects an increase of 33% in per capita personal income (in 1972 dollars) between 1983 and 2000. MAPC projects an increase of 46% in per capita money income (in 1986 dollars) between 1986 and 2000.

+ See Appendix A for the concepts and comparison.

VII. MAPC FORECAST IMPLICATIONS

During the past decade, the decline of industry and the rise of services have been dominant themes in the national economy. Locally, these trends have been partially offset by the development of computers and the dramatic growth of high technology. Today, the local base of "high-tech" manufacturing appears to be declining. With the ever increasing mobility of capital and "high-tech" production techniques that have evolved into routine factory work, employers are expanding where labor costs are cheaper and production rather than research and development is emphasized.

The changes in local manufacturing are a recurring regional and industry cycle reminiscent of the early 20th century when "high tech" and good wages meant textile and shoe production. Eventually most of these industries left for cheaper labor first to the nonunion southeastern states and then overseas, plunging the region into economic stagnation in the middle of this century.

Today, the region's "high-tech" exports are again threatened by market shifts and increasing foreign competition. The region's prominence in minicomputer manufacturing is being supplanted by cheaper, powerful personal computer workstation makers based on the west coast as well as in Asia. In addition, future growth in defense spending, an important regional export, may be curtailed by the need for federal fiscal austerity. In prosperous and steady times, exports enable a local economy to increase its income and employment opportunities beyond what local goods and services alone could provide.

The downside of this dependency is a contraction of markets during periods of rapid extra-regional economic, political, and technological change.

With a vibrant academic community captained by Harvard and MIT, the regional economy appears well situated for developing new industries based on scientific/engineering research and development. One of the major emerging "high-tech" frontiers is biotechnology. While this new industry and other emerging technologies face problems not confronted by their computer antecedents, the capacity for rapid expansion is also present.

Nationally, venture capital is not as readily available to finance new technology start-ups as in past decades. Moreover, "high-tech" was once synonymous with Route 128 and the Silicon Valley in California, MIT and Cal-Tech. Today, high-tech is international and can be found wherever major universities are located. Most emerging industries including biotechnology, however, are based on a heavy investment in human capital for ongoing research and development activities. This is well situated for the preeminent and concentrated university community found within the MAPC region.

Rapid employment growth in these emerging industries as well as continued growth in a variety of services will be constrained by a tight labor supply. The emerging difficulty in securing adequate labor will likely force firms spun off from our higher educational institutions to quickly set up production outside of the region once manufacturing techniques for their new product are standardized.

Low growth in population between the ages of 16 to 65 will not permit a sizeable increase in the labor force, despite the likelihood of further increase in female labor force participation. Nonresident commuters are likely to be of increasing importance as a source of new labor, especially for higher-wage jobs. Moreover, firms will tap inner-city pools of undereducated young adults as potential sources of labor, putting more pressure on public-private efforts to devise innovative job training and educational initiatives. Due to the confluence of a tight labor supply and persistent labor demand, high income growth is expected to exceed the national rate making education and training outreach viable.

The high level and growth rate of regional income will encourage businesses to seek feasible labor substitutes and reduce the rate of future job growth especially in the lower-wage employment sectors. In this inflationary environment workers will avoid job openings that pay especially low wages or are perceived to offer limited prospects for advancement in responsibility or salary.

Positions for department store clerks, fast-food cooks, nurses, teachers, clerks, hospital orderlies, hotel workers and secretaries will need restructuring to attract and retain a quality work force. Examples of such restructuring are emerging today. National retail and fast food chains offer workers entry to management tracks; secretarial work is growing as an entry level to professional and managerial responsibilities; teachers and nurses are demanding and being accorded professional-level salaries and dignity.

Union movements are also securing dignity, liveable wages, benefit packages and career ladders as organizers find fertile ground among large clerical and hotel staffs, the new production workers in the changing regional economy. Moreover, as single-parent and duel-income families become a larger proportion of the work force, the structuring of hours, medical benefits, and parental leave policies are becoming increasingly important in securing employee loyalty.

Some higher-paying service sectors, for example business services, will enable a small expansion in the service share of overall employment. Most of these higher-paying service jobs will be filled by the region's college graduates. The continuation of high housing costs for both rent and homeownership would seem to preclude drawing significant numbers of workers from outside of eastern New England. The slowdown in employment share growth after 1990 in finance, insurance and real estate reflects the nationwide retrenchment underway in a variety of financial activities, including real estate brokerage and mutual fund management.

The Boston metropolitan region is characterized by dependence on "high-tech" oriented exports, and is likely to exhibit a volatile pattern of employment growth with classic "boom and bust" cycles unless start-up industries can immediately follow the demise of maturing local industries. A high level of public investment in education and job retraining programs, and in a broad "social network" of unemployment, medical and other social benefits will be critical in supporting the extensive restructuring of workers into the growing employment sectors of the future.

APPENDIX A

DATA

Data on employment for the Boston Standard Metropolitan Statistical Area (SMSA) up to 1983 and on the Boston Primary Metropolitan Statistical Area (PMSA) after 1983 are available in the ES-202 and BLS-790 series which are collected by DES. The Boston SMSA consisted of 92 cities and towns whereas the new Boston PMSA consists of 106 cities and towns.

The ES-202 series is compiled from reports by industrial establishments and organizations which are covered under the Massachusetts Employment Security Law for provision of unemployment insurance. The BLS-790 series which provides data on nonagricultural employment, is based on representative sample surveys. The sample estimates are benchmarks annually to the industry employment levels derived from the ES-202 series. The BLS-790 series provides a time series on employment in the major industry divisions of the Standard Industrial Classification (SIC) codes. Early each year revised BLS-790 data is published which represents data adjusted to the most recent benchmark period, March of the previous year.

For the purpose of analyzing and forecasting trends in employment for the Boston metropolitan region, the BLS-790 data was used. Since the SMSA and PMSA are not comparable because of differences in geographical coverage, such data was suitably modified to construct comparable time series.

The present Standard Industrial Classifications date back only to 1972, with substantial SIC code changes before that year. Therefore, it was decided not to use pre-1972 data.

The reasons why MAPC decided to use the BLS-790 series are as follows.

1. The ES-202 series has been subject to undercoverage. For some sectors data are suppressed in publications to preserve the confidentiality of individual employers. Moreover, certain categories of employment which are not covered under employment security law are not reported.
2. The ES-202 is not a time series, though it has legal backing and is more reliable. The ES-202 data are not updated or revised in response to changes in classifications of SIC codes or changes in industry definition.
3. Using BLS data for employment forecasts for the MAPC region makes such forecasts comparable to the national forecasts developed by the U.S. Bureau of Labor Statistics (BLS) and national, state and regional forecasts developed by the U.S. Bureau of Economic Analysis (BEA).

TOTAL EMPLOYMENT BY PLACE OF WORK

BLS nonagricultural employment were used to create a time series for the MAPC region from data for the Boston SMSA from 1972 to 1983 and for the Boston PMSA from 1984 to 1986.

1. Town-wide employment for industrial sectors were taken from the ES-202 series published by DES for each of the 101 cities and towns which comprise the MAPC region. The figures were totalled to arrive at ES-202 equivalent figures for the MAPC region.

2. Statistics on employment under different sectors (excepting agriculture) were collected from the BLS-790 series* for the Boston SMSA/PMSA. BLS - equivalent figures for the MAPC region were calculated as follows:

   MAPC Total Annual Employment for each SIC code

   $$= \frac{\text{MAPC ES-202 employment}}{\text{SMSA/PMSA ES-202 employment}} \times \text{SMSA/PMSA BLS-790 employment}$$

   The sectoral figures were totalled to obtain BLS equivalent figures on nonagricultural employment for the MAPC region. Estimates of agricultural employment based on ES-202 figures for the agriculture sector were added to the nonagricultural totals so as to arrive at BLS equivalent figures of total employment for the MAPC region.

In this manner an employment by place of work time series was prepared for each SIC code and for total employment in the MAPC region for the period 1972-86. (See Appendix 4 to 14)

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* BLS-790 does not provide employment in agriculture

LABOR FORCE AND TOTAL EMPLOYMENT BY PLACE OF RESIDENCE

Time series on labor force and total employment by place of residence for the MAPC region were prepared as follows:

1. Data were taken from "Supplements to unemployment in states & local areas" published by the federal Bureau of Labor Statistics in 1985, 1986 and 1987 and totalled for the 101 cities and towns in the MAPC region.

2. Ratios of MAPC totals to PMSA/SMSA totals were calculated. For those years for which town-wide data were not available, backward extrapolation methods were used as follows:

MAPC Region labor force/total employment by place of residence in year t = BOSTON SMSA/PMSA figure in year t x Ratio of MAPC figure to SMSA/PMSA in year t+1

Labor force participation rates were obtained from the "Current Population Surveys", U.S. Department of Labor, Bureau of Labor Statistics.
(See Appendix 3)

ANNUAL PAYROLL AND AVERAGE WAGE

Data on annual payroll/average annual wage are published in ES-202 series by the Massachusetts Division of Employment Security (DES) for BOSTON SMSA/PMSA. Annual payroll data were totalled for the 101 cities/towns in the MAPC region.

Dividing such figures by the MAPC region's total employment figures gave the average annual wage in selected years. As expected the average MAPC region wage was almost equal to the average wage for the Boston SMSA/PMSA. Accordingly, the historical time series on average annual wage for SMSA/PMSA published by DES was taken as the time series of average annual wage for MAPC region. This approximation is acceptable because total employment between the SMSA, PMSA and the MAPC region differs only marginally. Moreover, average annual wage being an "average" is not likely to be affected by small increases in total earnings and total employment.

Average Annual Employment for MAPC region (1972-83)= 107% of average annual employment for the Boston SMSA (1972-83)

Average Annual Employment for the MAPC region (1984-86)= 104% of average annual employment for the Boston PMSA (1984-86)

A time series for 1972-86 on total annual payroll by place of work was prepared by multiplying the MAPC region's total employment to the corresponding average annual wage. Average wage and annual payroll are annual data unadjusted for inflation.
(See Appendix 6)

TOTAL INCOME

Total personal income is calculated by BEA using the following formula:

Total Personal Income = Earnings by place of work - personal contributions for social insurance + interest and transfer payments.

Although earnings by place of work were available, in the absence of data for the remaining items, it was not possible to derive total personal income as defined by BEA for the MAPC region. Alternatively, the concept of total money income defined by the Bureau of Census for statistical purposes was adopted. Such a figure includes:

(a) wage or salary income

(b) net non-farm self-employment income

(c) net farm self-employment income

(d) interest, dividends and net rental income

(e) social security and railroad retirement income

(f) all other regularly received income such as veterans' payments pensions, unemployment compensation and alimony.

Receipts not counted as money income include various "lump-sum" payments such as capital gains or inheritance. The total represents the amount of income received before deductions for personal income taxes, social security, bond purchases, union dues etc.

The Bureau of the Census concept of money income is not comparable to the concept of personal income, defined by BEA which is broader and which includes several nonmonetary sources.

Total income was calculated annually for each MAPC community during 1980-1985 by multiplying per capita income and population. Per capita income (defined as total income divided by total population) and population estimates are available for cities and towns in Massachusetts from the Bureau of Census. For 1986, estimates were prepared extrapolating the trend for 1980-1985. For 1972-1979, for which data were unavailable, backward extrapolation methods were used.

(See Appendix 16)

PER CAPITA INCOME

Per capita income for the MAPC region was calculated for 1980-1986 dividing total income by the region's total population. This method of calculating per capita income is not comparable to the per capita income data provided by BEA.

(See Appendix 17)

APPENDIX B

MAPC EMPLOYMENT, INCOME AND EARNINGS FORECAST METHODS

TOTAL EMPLOYMENT FORECAST METHOD

The steps in the MAPC total employment forecasts are as follows.

1. Preliminary exercises were made to discover the time trend in employment by regressing it on time/past values. It was observed that although the series on total employment was well-behaved, those for individual industries were erratic and it was not possible to approximate the behavior of employment in them during 1972-1986 by any mathematical or econometric relationship. Accordingly, it was decided not to use the regression approach in sectoral forecasting.

2. Following standard time series" forecasting methods, employment in time t (Et) was modelled as a function of past levels of employment (Et-1, Et-2, and Et-3). A lag of 3 years was considered appropriate given the cyclical behavior of data. The derived relationship was modelled in regression to study cyclical behavior around trend for the total employment series.

The results are summarized below.

REGRESSION OF MAPC REGION CURRENT EMPLOYMENT ON PAST EMPLOYMENT

$$E\ (t) = a + b\ E\ )t-1) + c\ E\ (t-2) + d\ E\ )t-3)$$

$$AVG\ E\ (t) = a + b\ AVG\ E\ (t-1) + c\ AVG\ E\ (t-2) + d\ AVG\ E\ (t-3)$$

$$E\ (t) - AVG\ E\ (t) = b\ [E\ (t-1) - AVG\ E\ (t-1)] + c\ [AVG\ E\ (t-2)]$$

$$- AVG\ E\ (t-2)] + d\ [E\ (t-2) - AVG\ E\ (t-2)]$$

(AVG = Average) E (t)= Employment in year t etc.

Regression Result

$$E(t) = \underset{(31.09)}{58.24} + \underset{(0.28)}{1.63}\, E(t-1) - \underset{(0.48)}{1.19}\, E(t-2) + \underset{(0.32)}{0.63}\, E(t-3)$$

$$R^2 = 0.96$$

To check the goodness of regression fit, several other models were fitted to the data and the results were analyzed. These models include:

$E(t) = a + b\,t$, $E(t) = a + b\,t$ + higher powers of time

$E(t) = a + b\,E(t-1) + c\,t$ + higher powers of time

3. Based on time series regression, a forecast for 1990 was derived. The forecast is considered reasonable because it takes into account not only the trend but also the cyclical factors.

Since the time series on total employment has only 15 observations, and since MAPC has already projected below-average labor force growth towards the end of the century because of the likelihood of limited population growth, it was considered appropriate not to use regression results for forecasting beyond 1990. Beyond 1990, the projection of total employment for the MAPC region was based on the following procedure.

Ratios of labor force/population, employment by place of residence/population, employment by place of work/population, employment by place of residence/labor force and employment by place of work/labor force were calculated for each year during 1980-1986. Such ratios were individually extrapolated for the year 2000.

Since from the projections of any two ratios, one can make reasonable inferences about the others, several consistency exercises were made based on the MAPC outlook for the metropolitan economy in 2000 and community-wide calculations to develop appropriate ratios.

Forecasts of total employment for 1995, 2005 and 2010 were developed using backward and forward extrapolation methods keeping in view the regression exercises and studying the extrapolation implications by way of consistency exercises. For various assumptions used see pages 11 and 12.

Community level projections were developed based on historical trends and taking into account community-specific factors. The important factors considered are:

a) Employment composition, such as an exceptionally large proportion of "high technology" employers or mature or declining industries.

b) Direct access to major highways, considered particularly important for a community to be able to accommodate commuters and support growth.

c) Adequacy of infrastructure, particularly water and sewer facilities, in supporting new business.

d) Attractive underutilized areas, identified by community officials which could be more intensely developed.

e) Vacant commercially and industrially zoned land, identified through MAPC's Vacant Sites Survey which could support future development.

f) Attitudes and policies of individual communities towards new economic development.

MAPC totals derived through community-level exercises were compared when deciding the appropriate ratios.

SECTORAL EMPLOYMENT FORECAST METHOD

The MAPC sectoral employment forecasts were developed as follows:

(1) Preliminary exercises were made for each sector to study the time trend in employment. Current employment was regressed on past values of employment by assuming auto-regressive relationships. Year-to-year cyclical fluctuations in the data are enormous and it was not possible to fit any econometric relationship. However, judgements were formed as to trends in employment and cyclical behavior.

(2) Average share of employment in each sector in the region's total was calculated for each year during 1972-86. The growth rate in sectoral share for 1986-1990 was arrived at using the average share for 1972-1986 and the average share for 1983-1986, each average share being considered as the figure for the mid-period. Using such growth rates, share of each sector in the region's employment was extrapolated for the year 1990. Beyond 1990, dampened extensions of such shares were made using historical growth rates based on average shares for 1973-76 and 1983-1986. Similar exercises were made in respect of shares of the MAPC region in Massachusetts employment to check the consistency of the forecasts.

(3) Final forecasts by MAPC of employment in different sectors represent a synthesis of the "bottom-up" approach of inferring from historical time series trends and analysis of future prospects and the "top-down" approach of inferring from movement in share of the region's employment in Massachusetts employment.

EARNINGS AND INCOME FORECAST METHOD

Forecasts for average annual wage in the Boston metropolitan region were developed using time series regressions (regressing average annual wage on past wage levels and time) with data from 1972 to 1986 and taking into account both trend and cyclical factors. The wage series exhibits a clearly noticeable and smooth trend. Therefore, a regression approach was considered appropriate. In fact, the explanatory power of the model was found to be extremely high. Annual payroll was forecast by way of multiplying projected wage with projected employment. Total income was projected, based on extrapolation of historical total income/annual payroll ratios and consistency exercises. Per capita income and household income were projected using the total income forecasts and the forecasts of population and number of households developed by MAPC.

APPENDIX C

NATIONAL, STATE AND REGIONAL FORECASTS

The Bureau of Labor Statistics (BLS), U.S. Department of Labor and the Bureau of Economic Analysis (BEA), U.S. Department of Commerce, have made national projections of employment for the major sectors. BLS projected civilian employment in 2000 by way of subtracting projected civilian unemployment from projected civilian labor force. BEA extended the BLS-projected downward trend in unemployment rates for the nation up to 2035. BEA has developed employment forecasts for Massachusetts and Boston-Lawrence-Salem-Lowell-Brockton (NECMA). The Massachusetts Division of Employment Security has made projections for the state for 1995. The only sector-specific employment forecasts available below the state level are those by BEA for Boston-Lawrence-Salem-Lowell-Brockton (NECMA).

BEA EMPLOYMENT FORECASTING METHOD

BEA's methodology for its metropolitan area forecasts is a "top-down" approach involving the following steps. First, national projections were developed and were distributed among the states according to the historical record or each state's contribution to the national totals.* For each state (Massachusetts in our case) projections were distributed between metropolitan and nonmetropolitan areas.

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*Forecasts are available in 1985 OBERS BEA REGIONAL PROJECTIONS Vol. 2, U.S. Department of Commerce, Bureau of Economic Analysis.

Second, for each metropolitan area (Boston-Lawrence-Salem-Lowell-Brockton in our case)* preliminary projections were generated based on a mathematical model. Third, the preliminary projections were reviewed and when necessary, were modified to account for economic trends that are not easily reflected in the mathematical relationship. In making projections for civilian employment, BEA calculated the historical average annual growth rate in the metropolitan area's share of state employment in each industry as follows:

1. The metropolitan area shares of state employment in 1969 and 1973 were averaged;
2. The metropolitan area shares of state employment in 1979 and 1983 were averaged, and
3. The ratio of the second average to the first average was used to estimate an historical average annual growth in metropolitan area shares.

Preliminary projections of the metropolitan area share of projected state employment in each industry were based on dampened extensions of the historical average annual growth rate in the metropolitan area share. Final projections were made by modifying preliminary projections, when necessary to take into account (i) unusually rapid growth or decline, (ii) permanent events such as factory shutdown, (iii) temporary events such as strike, or (iv) planned events such as opening of future facilities.

BEA adopted the following growth rates for growth in share of Boston-Lawrence-Salem-Lowell-Brockton (NECMA) in Massachusetts:

1983-85	90% of historical average annual rate
1985-90	80% of 1983-85 rate
1990-95	80% of 1985-90 rate
Each subsequent 5-year period	80% of the previous 5 year period rate

BEA EARNINGS AND INCOME FORECAST METHODS

The Bureau of Economic Analysis (BEA), U.S. Department of Commerce has made national, state, and metropolitan area projections of total earnings, personal income and per capita personal income in constant 1972 dollars. The BEA metropolitan areas projection methodology, again a "top-down" approach, consisted of the following steps.

1. Projecting Boston-Lawrence-Salem-Lowell-Brockton (NECMA) earnings per employee by multiplying the level in 1983 with a projected growth rate for earnings per Massachusetts employee.

2. Projecting Boston-Lawrence-Salem-Lowell-Brockton (NECMA) total earnings by multiplying the projected NECMA earnings per employee with the projected NECMA employment,

3. Projecting Boston-Lawrence-Salem-Lowell-Brockton (NECMA) total personal income by multiplying projected total earnings with projected personal income/earnings ratios,

4. Projecting Boston-Lawrence-Salem-Lowell-Brockton (NECMA) population by first multiplying the NECMA's population/employment ratio in 1983 with the projected growth rate in the population/employment ratio of Massachusetts; then multiplying that figure with the projected NECMA total employment, and

5. Projecting NECMA per capita personal income by dividing projected NECMA total personal income by projected NECMA population.

A major assumption underlying the BEA income forecasts is that, in the projection period, earnings per employee, the population/employment ratio, and the income/earnings ratio will grow at the same rate in the Boston -Lawrence-Salem-Lowell-Brockton (NECMA) as in Massachusetts.

APPENDIX 1

UNEMPLOYMENT RATES

YEAR	MAPC REGION	UNITED STATES
1972	6.5	5.6
1973	6.9	4.9
1974	7.1	5.6
1975	10.5	8.5
1976	9.1	7.7
1977	7.8	7.1
1978	5.8	6.1
1979	5.3	5.8
1980	5.1	7.1
1981	5.8	7.6
1982	6.7	9.7
1983	5.8	9.6
1984	4.2	7.5
1985	3.5	7.2
1986	3.4	7.0

SOURCE: MASSACHUSETTS DIVISION OF EMPLOYMENT SECURITY
CURRENT EMPLOYMENT STATISTICS

APPENDIX 2

MAPC REGION

LABOR FORCE AND EMPLOYMENT (BY PLACE OF RESIDENCE)

YEAR	LABOR FORCE	EMPLOYMENT	% OF LABOR FORCE EMPLOYED	UNEMPLOYMENT RATE
1972	1,313,237	1,227,696	93.49	6.51
1973	1,338,290	1,246,488	93.14	6.86
1974	1,361,256	1,265,143	92.94	7.06
1975	1,387,535	1,242,070	89.52	10.48
1976	1,385,046	1,258,719	90.88	9.12
1977	1,388,274	1,280,483	92.24	7.76
1978	1,430,648	1,347,190	94.17	5.83
1979	1,458,338	1,381,589	94.74	5.26
1980	1,457,603	1,383,253	94.90	5.10
1981	1,489,741	1,402,660	94.15	5.85
1982	1,511,850	1,410,709	93.31	6.69
1983	1,514,045	1,425,747	94.17	5.83
1984	1,557,260	1,491,606	95.78	4.22
1985	1,562,647	1,507,898	96.50	3.50
1986	1,577,014	1,523,580	96.61	3.39

SOURCE: MASSACHUSETTS DIVISION OF EMPLOYMENT SECURITY
CURRENT EMPLOYMENT STATISTICS

APPENDIX 3

BOSTON SMSA/PMSA
LABOR FORCE PARTICIPATION RATES

YEAR	MALE	FEMALE
1972	81.9	
1973	81.8	
1974	80.4	47.5
1975	80.6	50.0
1976	79.8	50.4
1977	79.5	53.3
1978	79.8	54.8
1979	79.5	55.5
1980	79.0	55.3
1981	77.2	56.8
1982	77.9	57.0
1983	78.2	56.7
1984	79.5	59.1
1985	78.4	60.3
1986	76.4	60.1

SOURCE: U.S. DEPT. OF LABOR,
BUREAU OF LABOR STATISTICS,
CURRENT POPULATION SURVEY (CPS)

APPENDIX 4

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (PLACE OF WORK)

SECTOR: ALL GOVERNMENT (SIC 91-97) & PRIVATE (SIC 1-89)

YEAR	AVERAGE ANNUAL EMPLOYMENT
1972	1,328,794
1973	1,358,336
1974	1,361,051
1975	1,319,578
1976	1,327,980
1977	1,375,181
1978	1,461,049
1979	1,511,602
1980	1,542,624
1981	1,548,692
1982	1,541,857
1983	1,592,133
1984	1,670,037
1985	1,693,404
1986	1,727,441

SOURCES: MASSACHUSETTS DIVISION OF EMPLOYMENT SECURITY. ES 202 EMPLOYMENT AND WAGE PROGRAM AND 790 CURRENT EMPLOYMENT STATISTICS.

Final regional estimates by METROPOLITAN AREA PLANNING COUNCIL.

APPENDIX 5

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: AGRICULTURE, FORESTRY AND FISHERIES (SIC 1-9)

	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	5,686	0.43
1973	5,811	0.43
1974	5,822	0.43
1975	5,769	0.44
1976	5,812	0.44
1977	6,015	0.44
1978	6,521	0.45
1979	6,907	0.46
1980	7,051	0.46
1981	7,079	0.46
1982	7,053	0.46
1983	7,955	0.47
1984	7,792	0.47
1985	7,918	0.47
1986	8,276	0.48

SOURCES: SAME AS APPENDIX 4

APPENDIX 6

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: MINING (SIC 10-14)

YEAR	EMPLOYMENT	%SHARE IN REGION'S TOTAL EMPLOYMENT
1972	300	0.02
1973	300	0.02
1974	305	0.02
1975	310	0.02
1976	312	0.02
1977	314	0.02
1978	320	0.02
1979	320	0.02
1980	341	0.02
1981	382	0.03
1982	430	0.03
1983	460	0.03
1984	510	0.03
1985	622	0.04
1986	770	0.04

SOURCES: SAME AS APPENDIX 4

APPENDIX 7

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: CONTRACT CONSTRUCTION (SIC 15-17)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	57,152	4.30
1973	54,997	4.05
1974	50,380	3.70
1975	42,274	3.20
1976	37,862	2.85
1977	36,630	2.66
1978	39,914	2.73
1979	42,171	2.79
1980	44,121	2.86
1981	44,878	2.90
1982	46,608	3.02
1983	46,416	2.91
1984	52,659	3.15
1985	57,857	3.42
1986	63,808	3.69

SOURCES: SAME AS APPENDIX 4

APPENDIX 8

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: MANUFACTURING (SIC 20-39)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	305,169	22.97
1973	310,321	22.84
1974	309,537	22.74
1975	281,764	21.35
1976	287,811	21.67
1977	300,242	21.83
1978	316,592	21.67
1979	326,895	21.62
1980	330,255	21.41
1981	329,116	21.25
1982	320,291	21.77
1983	337,120	21.17
1984	336,350	20.14
1985	319,196	18.85
1986	303,124	17.55

SOURCES: SAME AS APPENDIX 4

APPENDIX 9

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: TRANSPORTATION, COMMUNICATION & PUBLIC UTILITIES (SIC 40-49)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	79,483	5.98
1973	80,608	5.93
1974	77,642	5.70
1975	71,299	5.40
1976	69,663	5.25
1977	69,765	5.07
1978	71,197	4.87
1979	73,345	4.85
1980	74,777	4.85
1981	73,709	4.76
1982	72,665	4.71
1983	72,062	4.53
1984	75,707	4.53
1985	73,730	4.35
1986	73,524	4.26

SOURCES: SAME AS APPENDIX 4

APPENDIX 10

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: WHOLESALE TRADE (SIC 50-51)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	77,067	5.83
1973	78,053	5.78
1974	77,326	5.71
1975	75,978	5.79
1976	75,770	5.74
1977	76,885	5.62
1978	78,338	5.41
1979	81,477	5.43
1980	83,007	5.41
1981	82,502	5.36
1982	80,436	5.25
1983	85,557	5.39
1984	95,622	5.77
1985	96,501	5.73
1986	99,908	5.81

SOURCES: SAME AS APPENDIX 4

APPENDIX 11

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: RETAIL TRADE (SIC 52-59)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	229,380	17.35
1973	232,314	17.19
1974	230,152	17.00
1975	226,137	17.25
1976	225,520	17.07
1977	228,839	16.74
1978	233,163	16.09
1979	242,505	16.15
1980	247,060	16.12
1981	248,740	16.16
1982	251,749	16.42
1983	263,861	16.64
1984	280,508	16.92
1985	284,567	16.90
1986	290,300	16.90

SOURCES: SAME AS APPENDIX 4

APPENDIX 12

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: FINANCE, INSURANCE & REAL ESTATE (SIC 60-67)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	94,186	7.09
1973	96,004	7.07
1974	95,903	7.05
1975	94,186	7.14
1976	95,297	7.18
1977	98,325	7.15
1978	101,859	6.97
1979	104,786	6.93
1980	110,439	7.16
1981	115,029	7.43
1982	118,923	7.71
1983	119,098	7.48
1984	125,044	7.49
1985	130,822	7.72
1986	142,775	8.26

SOURCES: SAME AS APPENDIX 4

APPENDIX 13

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: SERVICES (SIC 70-89)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	285,282	21.57
1973	304,604	22.54
1974	318,868	23.55
1975	321,600	24.53
1976	329,986	24.98
1977	346,476	25.34
1978	378,129	26.09
1979	407,467	27.14
1980	424,644	27.70
1981	442,459	28.75
1982	454,692	29.65
1983	469,686	29.61
1984	498,226	30.05
1985	526,226	31.23
1986	546,187	31.79

SOURCES: SAME AS APPENDIX 4

APPENDIX 14

MAPC REGION

AVERAGE ANNUAL EMPLOYMENT (BY PLACE OF WORK)

SECTOR: GOVERNMENT (SIC 91-97)

YEAR	EMPLOYMENT	% SHARE IN REGION'S TOTAL EMPLOYMENT
1972	194,248	14.62
1973	194,146	14.29
1974	193,839	14.24
1975	197,620	14.98
1976	198,642	14.96
1977	209,677	15.25
1978	229,603	15.71
1979	222,552	14.72
1980	218,261	14.15
1981	202,145	13.05
1982	187,462	12.16
1983	191,855	12.05
1984	193,256	11.57
1985	195,272	11.53
1986	197,535	11.43

SOURCES: SAME AS APPENDIX 4

APPENDIX 15

MAPC REGION

AVERAGE ANNUAL WAGE

YEAR	AVERAGE ANNUAL WAGE ($)	ANNUAL PAYROLL ($ '000)
1972	8,496	11,289,439.6
1973	8,978	12,195,146.5
1974	9,530	12,970,817.4
1975	10,238	13,509,841.2
1976	11,552	14,386,013.1
1977	12,245	15,886,013.1
1978	13,228	17,890,545.5
1979	13,228	19,995,475.8
1980	14,800	22,830,841.1
1981	16,200	25,088,814.9
1982	17,600	27,136,688.4
1983	18,700	29,772,904.1
1984	19,945	33,308,902.8
1985	21,355	36,162,653.6
1986	22,808	39,399,491.6

SOURCES: MASSACHUSETTS DIVISION OF EMPLOYMENT SECURITY.
Regional estimates calculated by the METROPOLITAN AREA PLANNING COUNCIL.

APPENDIX 16

MAPC REGION

TOTAL INCOME (IN MILLIONS OF DOLLARS)

YEAR	TOTAL INCOME
1972	12,726.28
1973	13,863.14
1974	15,034.44
1975	16,047.27
1976	17,340.44
1977	18,878.63
1978	20,916.79
1979	23,369.63
1980	26,244.49
1981	28,879.64
1982	31,264.31
1983	33,754.45
1984	37,093.18
1985	40,321.11
1986	43,684.30

SOURCES: BUREAU OF THE CENSUS, U.S. DEPT. OF COMMERCE.
METROPOLITAN AREA PLANNING COUNCIL.

APPENDIX 17

MAPC REGION

PER CAPITA INCOME (IN DOLLARS)

YEAR	MAPC REGION POPULATION	PER CAPITA INCOME ($)
1980	2,884,712	9,098
1981	2,880,764	10,025
1982	2,876,815	10,868
1983	2,883,256	11,707
1984	2,889,697	12,836
1985	2,886,989	13,966
1986	2,882,990	15,152

SOURCES: BUREAU OF THE CENSUS, U.S. DEPARTMENT OF COMMERCE.

METROPOLITAN AREA PLANNING COUNCIL has interpolated to obtain the year between the every two year estimate by the Bureau of the Census.

APPENDIX 18

MAPC REGION

RATIOS OF LABOR FORCE/POPULATION, EMPLOYMENT/POPULATION ETC. (%)

YEAR	LABOR FORCE/ POPULATION	EMPLOYMENT (BY WORK)/ POPULATION	EMPLOYMENT (BY RESIDENCE)/ POPULATION	EMPLOYMENT (BY RESIDENCE)/ LABOR FORCE	EMPLOYMENT(RES)/ EMPLOYMENT(WK)
1980	50.53	53.48	47.95	94.90	89.67
1981	51.71	53.76	48.69	94.15	90.57
1982	52.55	53.60	49.04	93.31	91.49
1983	52.51	55.22	49.45	94.17	89.55
1984	53.89	57.79	51.62	95.78	89.32
1985	54.13	58.66	52.23	96.50	89.05
1986	54.70	59.92	52.85	96.61	88.20

SOURCE: METROPOLITAN AREA PLANNING COUNCIL.

APPENDIX 19

COMPARATIVE EMPLOYMENT FORECASTS: 2000
TOTAL EMPLOYMENT (in 000's) & PERCENT SHARE (%)*

INDUSTRY	UNITED STATES		MASSACHUSETTS	BOSTON NECMA	MAPC REGION
	BY BLS+	BY BEA	BY BEA	BY BEA	BY MAPC
AGRICULTURE	2,917	1,412	33.80	18.00	11.10
	(2.2)	(1.0)	(0.09)	(0.7)	(0.6)
MINING	724	1,261	1.70	1.20	1.17
	(0.5)	(0.91)	(0.0)	(0.0)	(0.1)
CONSTRUCTION	5,794	7,020	168.10	107.40	73.24
	(4.3)	(5.1)	(4.2)	(3.9)	(3.6)
MANUFACTURING	18,160	23,321	851.30	578.00	336.13
	(13.7)	(16.9)	(21.2)	(20.8)	(15.6)
TRANSPORTATION	5,719	6,974	171.30	134.10	86.76
	(4.3)	(5.0)	(4.3)	(4.5)	(4.3)
WHOLESALE TRADE	7,266	7,230	206.60	146.30	111.37
	(5.5)	(5.2)	(5.2)	(5.3)	(5.5)
RETAIL TRADE	22,702	23,299	680.70	435.20	336.13
	(17.1)	(16.8)	(17.0)	(15.6)	(16.7)
FINANCE, INSURANCE & REAL ESTATE	7,917	8,845	265.20	204.40	180.37
	(6.0)	(6.4)	(7.1)	(7.3)	(8.9)
SERVICES	32,545	35,534	1186.70	875.20	661.57
	(24.5)	(25.7)	(29.6)	(31.4)	(32.8)
GOVERNMENT	18,329	19,687	427.20	289.90	242.31
	(13.8)	(14.2)	(10.7)	(10.4)	(12.0)
TOTAL	133,030	138,338	4006.40	2784.70	2017.76

Percentages may not add up to 1 exactly because of rounding

These forecasts represent the BEA moderate or middle growth forecasts.

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